# Mathematics Standard 2 Year 12

# Sample Assessment Task

## Applications of Algebra: Modelling for Profit

***Sample for implementation for Year 12 from Term 4, 2018***

### Context

Students have engaged in learning for the subtopic, Types of Relationships. They have participated in activities to develop knowledge of the concepts of graphing and interpretation of relationships, and skills to solve a variety of problems.

Students will require approximately three hours of independent preparation; including class time to discuss the notification and task requirements.

The task notification includes three questions. The questions including the marking criteria will be handed out with the notification.

### Notes to teacher

Throughout the development of this task, teachers should monitor authorship and the progress of student work. All responses will be submitted on the same day.

When individual feedback is provided after marking, there will be opportunity to discuss the challenges of the task with the class and consider future learning activities to assist student learning.

# Applications of Algebra – Modelling for Profit

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| Task number: 3 | Weighting: 30% | Timing: Term 2, Week 3 |
| Outcomes assessed  * uses detailed algebraic and graphical techniques to critically evaluate and construct arguments in a range of familiar and unfamiliar contexts MS2-12-1 * solves problems by representing the relationships between changing quantities in algebraic and graphical forms MS2-12-6 * chooses and uses appropriate technology effectively in a range of contexts, and applies critical thinking to recognise appropriate times and methods for such use MS2-12-9 * uses mathematical argument and reasoning to evaluate conclusions, communicating a position clearly to others and justifying a response MS2-12-10 | | |
| Nature of the task This assignment involves the use of algebraic relationships and graphs to solve real world problems.  All parts of the task are to be completed individually. When working during class time, students can access all class notes and practice questions. Students will need to access digital technologies during class time. | | |
| Marking criteria You will be assessed on how well you:   * accurately solve a variety of problems based on the scenarios * select and use appropriate mathematical processes, technologies and language to investigate, organise and interpret graphs and relationships * provide reasoning and justification related to the problems. | | |
| Feedback provided The teacher will provide feedback outlining strengths and areas for improvement to build on knowledge, understanding and skills for future learning. | | |

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| Student Name: | | |
| Modelling for Profit | | |
| Understanding, Fluency and Communication | | Marks |
| 1. | A graph illustrating the cumulative number of apps downloaded from the Apple App Store can be viewed at <https://www.statista.com/statistics/263794/number-of-downloads-from-the-apple-app-store/>.   1. Describe the growth in the number of apps downloaded from the Apple store as illustrated in the graph. 2. Comment on the validity of the presentation of the information. 3. Using spreadsheets and graphing technologies find an approximate equation that models the information from March 2012 to September 2016. Provide an explanation of your strategy that includes screenshots of your work. 4. Use your model to predict the cumulative number of apps that will be downloaded from the Apple App Store by December 2017. 5. Explain the strengths, limitations and validity of your model and state any assumptions that you have made. | **10** |
| Problem Solving, Reasoning and Justification | |  |
| 2. | The Year 11 Jersey Committee is trying to decide on the company from which they will purchase their commemorative jersey. They have to decide between the following two options:  Company A supplies jerseys at a base price of $39.95 each. For each jersey, a personalised logo on the front will cost $6.95, a name on the back costs $4.95 and a number on the back costs $4.95. There is no setup fee but they charge a delivery fee of $250.  Company B charges a set-up fee of $1000 that includes the logo on the front and the names and numbers on the back. Jerseys then cost $40 each. There is no additional delivery fee.  From past experience, both companies produce jerseys of equivalent quality.  What advice would you give the committee to help them decide between the two companies?  Use your knowledge of linear functions and graphing technologies to support your advice with visual displays and reasoning. | **10** |
| 3. | The school musical will be held in a hall that has a seating capacity of 600. In the past, the musical committee has sold tickets for $10 each and tickets have always sold out.  The committee is planning to increase the cost of the ticket price but they are concerned because they predict that for each $1 rise in the ticket price they will fail to sell 25 tickets. They have come to you for advice.  Prepare an analysis for the committee with a recommendation for the new ticket price. The committee is also interested to know the expected increase in revenue. | **10** |

**End of task**

### Marking guidelines

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| Question 1 – Understanding, Fluency and Communication | | Marks |
| (a) | * Identifies the correct type of relationship * Correctly describes the growth | **1**  **1** |
| (b) | * Provides a clear explanation of validity of graph using appropriate mathematical terminology | **1** |
| (c) | * Displays a spreadsheet showing the correct information * Displays a screenshot of modelling the information to find an approximate equation * Explains the modelling to find an approximate equation * The equation that models the situation is reasonable. | **1**  **1**  **1**  **1** |
| (d) | * Makes a correct prediction from the model that has been selected. | **1** |
| (e) | * Correctly identifies key strengths and/or weaknesses of the model * Validates the choice and makes a statement of the underlying assumptions. | **2** |

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| Questions 2 and 3 – Problem Solving, Reasoning and Justification (Each question is worth 10 marks and is marked separately) | Marks |
| A student: |  |
| * demonstrates a thorough understanding of the mathematics involved in solving the problem * uses appropriate mathematical processes in solving the problem without error * communicates in a concise and systematic manner and justifies conclusions using appropriate mathematical language, notation and symbols | **8–10** |
| * demonstrates understanding of the mathematics involved with appropriate calculations with either a minor arithmetic or calculation error OR all mathematical calculations have been carried out without error but the final conclusion is incorrect * communicates in a concise and systematic manner and justifies conclusions using some mathematical language, notation and symbols | **5–7** |
| * demonstrates progress towards a solution with some error * demonstrates a developing understanding of what it means to work mathematically with some use of mathematical language, notation and/or symbols | **3–4** |
| * demonstrates a limited understanding of the mathematics involved in solving the problem * demonstrates a limited use of mathematical language | **1–2** |